Team Osprey Redefines Training

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Improving the way that training development is integrated into the life cycle of a weapons platform is a much needed acquisition reform. Training is, unfortunately, often the first subprogram to be suggested when program managers look to reduce costs. From an organizational perspective, training managers are rarely at a level of parity with systems engineering and other subprogram offices.

The V-22 Osprey tilt-rotor aircraft, whose variants will enter service with the Marine Corps, Navy, and Air Force Special Operations community later this decade, is being supported by a transformational program that has elevated training to a level of equity within the organizational structure and made other reforms to increase the effectiveness and visibility of training within the program.

From Tragedy to Transformation

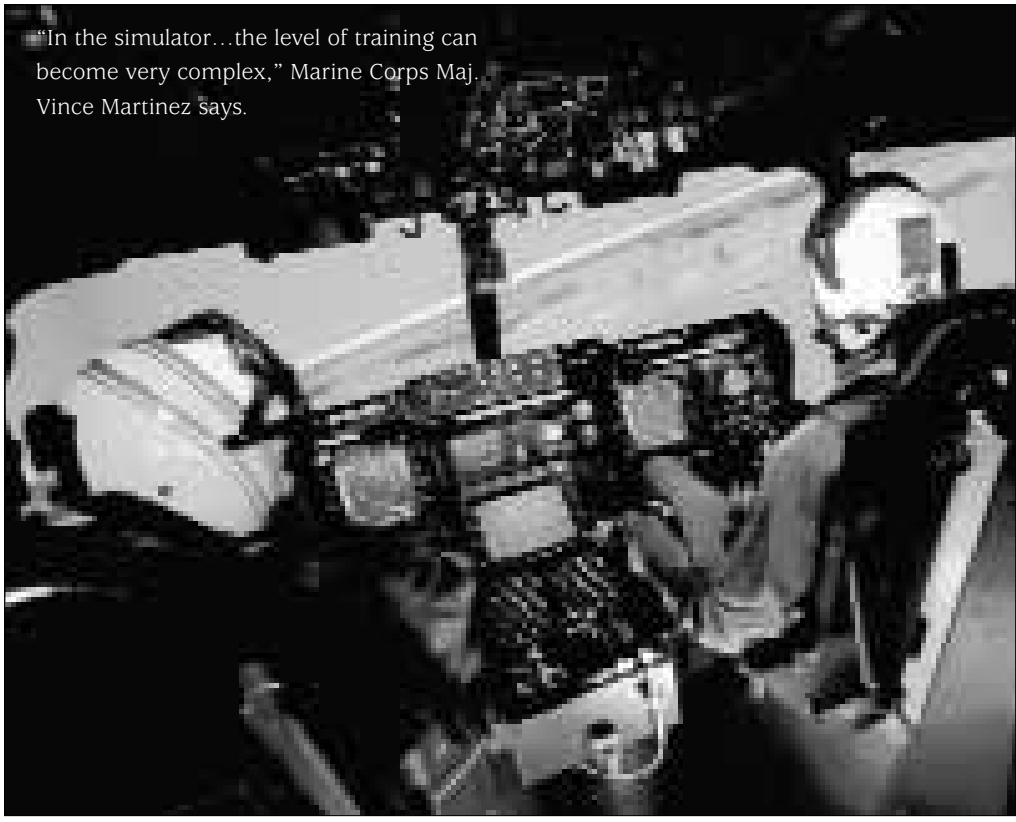
The V-22 program has faced difficult challenges. In December 2000, just as the program approached the decision to enter full-rate production, one of the test aircraft experienced a fatal and very public accident during a routine training mission. The fleet was grounded and two independent assessments were chartered—the Panel to Review the V-22 Program (DoD Blue Ribbon Panel) and a NASA Ames Research Center Review.

Although each assessment recommended, independently, that the program move forward, specific engineering changes and improvements were needed. Indeed, while the Blue Ribbon Panel concluded that pilot training was adequate, it also opined that "historical precedent suggests that funding may not remain stable throughout upcoming budget cycles" and recommended that adequate funding be provided for aircrew ground training, aircraft simulators, and upgrades to training devices.

The V-22 program office accepted this and other recommendations, conducted a rigorous analysis in training and other missions, and recast the way it operates, creating a new program—unique in many ways, including the transformational redesign of the complete Osprey training system.

With strong leadership, tragic events can become the impetus for success. This seems to have been the case for the V-22. A fleet of nine test aircraft logged more than 1,300 flight hours to complete developmental testing and begin the follow-on operational evaluation phase in January 2005.

The transformation was achieved not through some exotic technology, but through a rigorous application of long-known but sometimes-forgotten training and acquisition principles. Strict adherence to instructional system design has allowed training tasks to be allocated to the classroom, the simulator, and the live-fly aircraft in a way that



"In the simulator…the level of training can become very complex," Marine Corps Maj. Vince Martinez says.

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Photography courtesy Flight Safety International

will save over $1 billion in training aircraft costs. A real partnership between business and government, combined with an open mind to commercial off-the-shelf (COTS) products and other technology innovations, has enabled all training products to be delivered on time, on cost, and before the primary system, so the initial crew training is on the training system, not in the factory.

Focus on the Warfighter

"By making the training system the first priority for program funding, we are doing something that no other major acquisition programs are doing that I am aware of," says retired Marine Corps Lt. Col. Ken Fancher, the former V-22 training systems manager.

State-of-the-art glass cockpit technology permits the program to make the leap from early 1960 era to latest technology. Higher-fidelity visuals, motion and other flight simulator subsystems, and other innovations also help. Osprey accession pilots accomplish more than 50 percent of their training in a ground-based environment. This compares with a 5 percent ground-based training percentage for the venerable CH-46 helicopter. "This is a transformation of Marine Corps aviation," Fancher says. Other transformational aspects are evident throughout the program.

In legacy acquisition programs, the warfighter defines training requirements and passes them to the Service acquisition team and the contractor to build trainers and other products. The Osprey team relies on regular warfighter participation throughout the development process to build the training system. "What this means is that at this and every other critical decision point, the warfighter is part of the decision. For every trade-off we discuss, the warfighter weighs in with a perspective," Ward Carroll, V-22 spokesman, says.

This focus on warfighter participation allowed the up-front analysis to be completed as envisioned. Early user inputs in the curriculum process included:

- Defining every pilot and aircrew training task
- Determining the level of proficiency at which each task must be conducted
- Specifying how often each task must be trained.

It is the V-22's end user who defines success (i.e., effectiveness of a training device) for the training continuum. "In previous acquisition models, all of the groups—the training device managers, classroom instructors and others—defined success separately," Osprey program analyst Robert Cox says. "In the V-22 training model, there is only one person who defines success—the user. If the training system change does not meet the user's need, another change will be submitted and will be passed through the requirements process."

Reducing Training Costs

The V-22's training systems approach is expected to yield dividends for Marine Corps aviation. The Osprey team projects that by optimizing simulators to complete up to 75 percent of 100-level training at the Fleet Replacement Squadron (FRS), the number of MV-22 aircraft marked for training can be reduced from 40 to 20. "This is about $1.2 billion in cost avoidance from not buying 20 additional training aircraft—not a small sum," Cox points out.

Cox reiterates that for any other Corps aviation program to reduce flight hours and realize similar efficiencies, it would need a V-22-like training system that would include not only high-fidelity simulators, but also effective courseware and other components.

The program is looking to obtain similar savings through the increased use of simulation at 200- and 300-level FRS training, with plans that include the use of simulators for 50 percent of that training.

Other data are also impressive. The program's effort to deliver its training products better, faster, and cheaper enables it, in part, to train a 100-level FRS student for $450,000. Comparable per-student training costs for other programs are CH-53E Sea Stallion helicopter ($980,000) and F-18C Hornet ($1.8 million).

Delivering Increased Effectiveness

In addition to cutting training costs, the Osprey team is looking to achieve other measures of effectiveness to help shape tomorrow's aviation community.

Legacy weapon platform programs have a track record of belatedly incorporating their latest hardware and software system changes into training devices. As a result, changes to tactics, lessons learned, and engineering plans are seldom integrated into training devices in a timely manner. "Training systems lag grossly behind the aircraft—by an average of two years. As a result, you often have training devices that are not relevant," Cox says.

The V-22 program is determined to integrate platform changes more efficiently into program devices. "If we are

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spending $25 million for a simulator, it will become a door stop in a few years if it's not kept current," according to Deborah Paris, Osprey training concurrency manager, whose team monitors platform changes after the training device is delivered.

One acquisition strategy that helps to correct this disconnect is to optimize COTS technology in training devices. For example, with the exception of the cockpit, 100 percent of the MV-22 full flight mission simulator hardware is COTS. This plan also enabled the program's seventh training device to be delivered under budget and ahead of schedule.

Since 2000, Team Osprey has also involved the aircraft configuration management team in the concurrency process. V-22 maintenance and flight training devices are Block A-concurrent—matching the huge change that has been made to the aircraft since the December 2000 pause in the testing program. As a result, aircrews have trained in Block-A-type simulators since June 2003—*before* the actual aircraft were delivered in November of that year! This outcome was made possible thanks to the of the program's priority to fund training systems.

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The End-User Connection

The training concurrency integrated product team, a V-22 curriculum working group, and other program teams include the users, the acquisition community, and industry team members. The end users are objectively asked whether to incorporate change inputs, including those that originate from aircraft modifications, the curriculum, the users themselves, and other sources.

The program uses its instructional systems design to produce the master task list, which represents "training objectives, all of the tasks, learning objectives, and everything else that has to do with training," Paris says, adding that this part of the process allows the team "to run a change through the master task list and get an objective point of view." The training concurrency integration process evaluates where in the training system a change needs to be inserted, whether in a simulator, a training device, or another component. One envisioned outcome is to help the program to establish all training and associated costs at the front part of the budget planning cycle.

Paris summarizes her integrated product team's efforts: "That's what we are doing at this time—going through the policy and procedures to prove the concept of whether we can incorporate all of the program's changes into our training concurrency model." To successfully meet this goal, her team maintains a close working relationship with Marine Corps Training and Education Command, Quantico, Va., and other Service offices.

Another projected outcome of the IPT's efforts will be to reduce the time to integrate a change submitted by the user into a training system. Through focused efforts, the V-22 program office wants any change routinely made in 48 hours. "We want to get to the point where, if we wanted to submit a change, we would know how many pages of interactive multimedia instruction are affected," Paris says. And it follows, she adds, that if training devices are concurrent and have commonality with the supported

aircraft, the pilots will want to train with those systems.

Marine Corps Maj. Vince Martinez, assigned to VMX-22 at Marine Corps Air Station New River, N.C., summarizes the fidelity of a V-22 Full-Flight Simulator and the benefits of training in a state-of-the-art environment: "While it is very hard to make any simulator absolutely realistic, with the high fidelity FFSs that we currently have, it is possible to generate tactical scenarios with networked devices that provide very realistic training. If I network a training mission with two devices and two sets of pilots, and the second aircraft is flying off a lead aircraft in virtual space, or if the lead aircrew turns early or misses a checkpoint on a route, they are forced to react to the mistake the same way they would in the actual aircraft."

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Martinez continues, "In the simulator we can add night vision goggles or forward looking infra-red devices, reduce light levels, or add the weather to obscure the visual cues, and then introduce threat that can 'shoot' them out of the sky. The level of training can become very complex." He adds that the realism is not just a product of the simulator itself, "but rather, it's in the fact that I can tax the pilot's decision cycle and keep him reacting to things external to his aircraft. This is a significant shift from the cockpit procedures trainer mentality that has typically been associated with aircraft simulators."

Lessons Learned

Fancher says that DoD Directive 5000.1 (The Defense Acquisition System) and DoD Instruction 5000.2 (Operation of the Defense Acquisition System) "give me, as a program manager, a lot more guidance in terms of my responsibility for the entire life cycle of this training system." This is a monumental change in how the Defense Department's training systems have been managed. "In the past, program managers concentrated on putting their hardware on the concrete on cost and on schedule, and then leaving it—they were done and left the follow-on work for the type commander," Fancher reflects. Now the entire life cycle, including keeping the device current with the supported aircraft, is important, he adds.

Asked what lessons learned from his V-22 program experience he would provide to a Defense Acquisition University PM course, Fancher replies that teamwork is at the top of his list. "A lot of people in other DoD acquisition programs say that they function as a joint IPT, but they really don't. Without teamwork, that concept won't succeed," he points out.

Fancher also notes, "Things are going to go wrong. The manager doesn't own that information. He or she has to be at peace with that inevitability." Accordingly, PMs need to organize a system that will allow them "to effectively communicate any problems with the warfighters and the acquisition chain of command before the leadership reads about them in the morning paper."

In an effort to obtain the best-of-breed practices throughout the military and civilian training community, the Osprey training team maintains an open dialogue with the F-35 Joint Strike Fighter and other weapon platform programs, and visits commercial airline and training system company offices.

Addressing the significance of the team's gaining training insights from the commercial airline industry, Carroll observes that despite the breathtaking advances in digital architectures, other technologies, and their applications during the 1980s and 1990s, "naval aviation—and I include Marine Corps aviation—really didn't believe that there was a lot of value in simulators. In order to replicate mission training, you had to be in the airplane. So this is the element that is not minor about learning from the airline industry: When you use their approach—for a simulator to be the real training—and provide the 'check-in-the-block,' it changes everything."

The program's collaboration among warfighter, industry, and Service program office has fostered a level of communication and cooperation in an acquisition program that is refreshing. This is the way that we should conduct business with respect to integrating training into our weapons platform and system programs, particularly for major defense acquisition programs.

As our office continues to work with the Services to ensure that training systems are efficiently integrated throughout a weapon platform's life cycle, we look forward to assisting other programs to collaborate with the Osprey office and gain insight into and use the best practices that helped it achieve its recent successes.

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